

McDonald, Jeffrey

From: Gilmore, Tyler J <Tyler.Gilmore@pnnl.gov>
Sent: Friday, February 07, 2014 4:09 PM
To: McDonald, Jeffrey
Cc: Greenhagen, Andrew
Subject: Annular Pressurization System for Injection Wells
Attachments: EPA_IR8_for_FG-RPT-017.pdf

Jeff,
Attached are our responses to your questions on the Annular Pressurization System (IR8_01-31-2014). Please call if you have any questions.

Thanks

Tyler

IR8

(12)

01-31-2014: Teleconference call with Jeff McDonald (EPA) on 1/31/2014, "Information Request (IR) #B (IR8_01-31-2014)"					
IR #	Subject	Page	Doc. Sec.	Par.	FutureGen Response
01-31-2014_01	Annular Pressurization System			<p>In the subject phone call, EPA asked the Alliance to "Please provide more information on your annular pressurization system."</p> <ul style="list-style-type: none"> • Is the pressurization system designed to maintain a pressure in the annulus that is greater than 100psi above the injection pressure within the injection tubing? • Is the 100psi pressure differential maintained throughout the system? • What is the operating pressure range for the annular pressurization system? 	<p>The Annulus Fluid Pressurization System (APS) is an engineered system designed to automatically maintain an annulus fluid pressure above the CO₂ pressure inside the tubing along the entire length of the tubing from surface to the packer. The APS will be operated to maintain a surface annulus pressure between 100 and 400 psi above the surface CO₂ injection pressure.</p> <p>Appendix A provides additional information regarding the APS.</p>

Appendix A

IR01-31-2014_01

Additional Information Regarding
Annulus Fluid Pressurization System (APS)

Annulus Fluid Pressurization System (APS) Description

The annulus fluid pressurization system (APS) is an engineered system designed to automatically maintain an annulus fluid pressure above the CO₂ pressure inside the tubing along the entire length of the tubing from surface to the packer. The APS will be operated to maintain a surface annulus pressure between 100 and 400 psi above the surface CO₂ injection pressure. For example, for a surface CO₂ injection pressure of 1,289 psia, the annulus pressure at the surface will be between 1,389 and 1,689 psia. Figure 1 illustrates that the annulus pressure will be higher than the pressure inside the tubing along the entire length of the annulus. This example is based on a packer depth of approximately 3,960 ft (Total Vertical Depth).

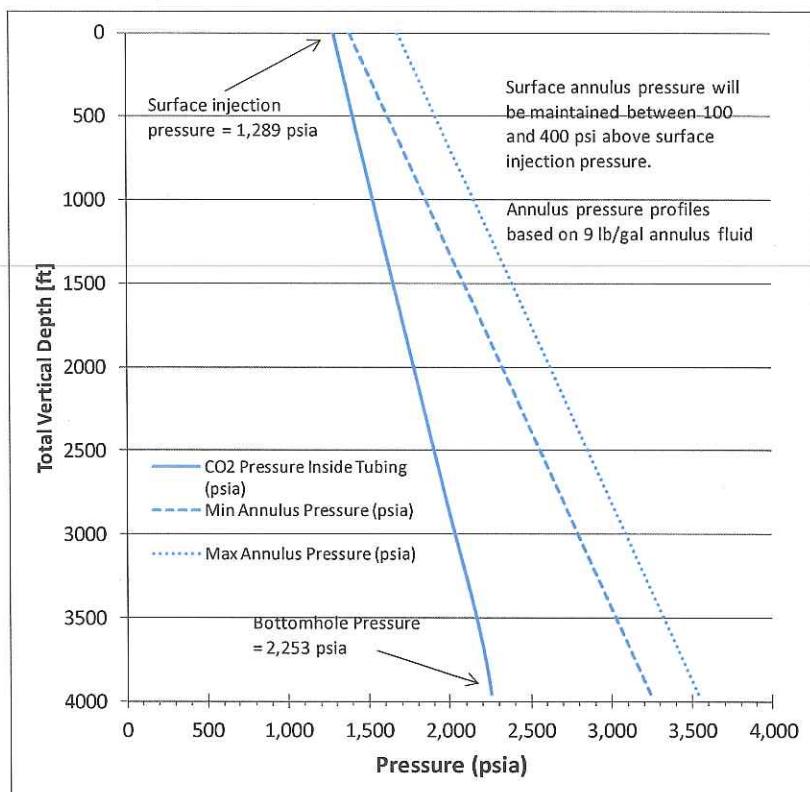


Figure 1. Relationship between annulus pressure and tubing pressure along the length of the annulus.

The APS will alarm when the annulus pressure falls below an established set point – for example injection pressure +100 psi – and halt injection to the well when the annulus pressure falls below a lower set point, for example injection + 50 psi.

The APS design pressure limit is 3,000 psi; however, it is anticipated that the system will be operated at a much lower pressure because CO₂ injection pressure will be considerably lower than the design pressure limit. The system will incorporate several safety relief valves that will be set between 2500 and 2800 psi. The APS is a common system for all four injections wells. Each well will have a dedicated line from the APS and will be monitored for flow into and out of each well's annulus to detect any significant fluid leakage from a well. It is anticipated that the daily temperature swings will cause some flow into the well (annulus) during the evening and some flow out of the well (annulus) during the day due to the small change in annulus fluid density with temperature. These pressure swings from these flows will be within the range of the APS operating parameters.

